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Summary of the Ph.D. Thesis

# Populační perspektivy Kazachstánu do roku 2030
# Population prospects of Kazakhstan till 2030

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**Populační perspektivy Kazachstánu do roku 2030**

**Abstrakt**

Populační vývoj do značné míry ovlivňuje objem národ 20 důchodu, stejně jako poptávku po základních veřejných službách (školství, zdravotnictví, doprava, aj.), a tedy podstatnou část mandatorních výdajů veřejných rozpočtů. Proto informace o budoucí početní velikosti a struktuře obyvatelstva získané pomocí prognózy obyvatelstva nacházejí široké uplatnění v rozhodovacím procesu, a to nejen v oblasti veřejné správy. Hlavním cílem této práce je sestavení a porovnání výsledků tří metodologicky odlišných prognóz vývoje obyvatelstva Kazachstánu do roku 2030 a na základě analýzy dosavadního vývoje i porovnání výsledků vytvořených prognóz zjistit nejdůležitější faktory určující populační vývoj v zemi. Kazachstán je specifický jak svou územní velikostí, tak i značnou regionální rozmanitostí. Za těchto podmínek je oprávněné a zároveň nutné zabývat se otázkou odpovídajícího odrazu prostorové a rezidenční diferenciace ve způsobu tvorby prognóz. Územní rozložení obyvatelstva Kazachstánu je značně nepravidelné. Vyšší hustotu zalidnění a velmi mladou strukturu obyvatelstva vykazují zejména jižní regiony, což znamená, že značná část reprodukce obyvatel země je a v příštích desetiletích bezpochyby bude koncertována právě do těchto oblastí. Zároveň původní obyvatelstvo asijského původu, které se kromě jiného vyznačuje podstatně vyšší plodností než obyvatelstvo alochtonní, má tendenci se koncentrovat ve venkovských oblastech. Městská sídla pak obvykle vykazují

podstatný podíl alochtonního obyvatelstva a tím i odlišné reprodukční poměry. Přes značné regionální a rezidenční demografické rozdíly, země jako celek prochází v současné obdobím zvýšené porodnosti vedoucí k poměrně dynamickému populačnímu růstu. V Kazachstánu se má všeobecně za to, že tento pozitivní trend vývoje obyvatelstva bude pokračovat i v budoucnosti. Přitom však prakticky neexistují žádné prognózy obyvatelstva, nebo nějaké jiné důkazy, že tomu opravdu tak bude. V této práci se proto pokoušíme na základě analýzy současné demografická situace a aktuálního populačního vývoje odhadnout nejpravděpodobnější budoucí vývoj populační vývoj Kazachstánu a určit, zda zohlednění regionálních a rezidenčních odlišností má významný vliv na obraz budoucího vývoje obyvatelstva země.

**Klíčová slova**: obyvatelstvo, populační vývoj, prognóza, projekce, Kazachstán

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**Population prospects of Kazakhstan till 2030**

**Abstract**

Population change affects national income, national expenditure, and the demand for services such as education, health and transport. Therefore, information about future population size and structure obtained with the help of population forecasts, which can be used for a wide range of decision-making purposes, is of paramount importance. The primary aim of this dissertation is to produce three different types of population forecasts for Kazakhstan till 2030 and by comparing and analysing the differences to find out 2 ost important factors determining the population development process in the country. Kazakhstan is a country with significant size and regional diversity which makes it relevant to consider those dimensions in population forecasting. Most southern oblasts of the country have a young population structure meaning that much of future population growth, particularly of working age, will come from these regions. Also, native population tends to concentrate in rural areas, while industrialized cities are mostly populated by non-natives with considerably different nuptiality and fertility behaviour. Despite such regional and residential demographic differences, presently the country is experiencing an overall increase in birth rates. Many claims are made that this upward fertility trend will continue in the future, however no quantitative population forecasts, or indeed any other evidence, have been produced at the source of these claims. In this study we attempt on the basis of the current

demographic situation's analyses to find out most probable future population development patterns in Kazakhstan and to identify whether regional dissimilarities really make any great difference in the forecast results or not.

**Keywords:** population, development, forecast, projection, Kazakhstan



inevitably change with the change of generations. For the time being, the first step in that direction is already done the followings will be much easier to carry on.

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with residential and regional socioeconomic situations have contributed to the dynamics of Kazakhstani population at national and regional levels. However, results of population forecasts have illustrated that despite different assumptions concerning regional demographic parameters the expected total population numbers are not so very different. It may imply that future homogenisation of regions probably will even further diminish the existing presently differences on a national scale.

The possible explanation of little difference between total numbers of the general level forecasts and regional ones could be that we have applied a similar approach to all of them. The next step could involve application of some other approaches to forecasting population.

Likewise, the available data from multiple data sources could be interesting to use in the future analysis, particularly if more attention is paid to the data problems (i.e. censoring and irregular patterns). Furthermore, once we have the appropriate data, the application of multistate demographic analysis could be initiated at the state level at least. Also it would be instructive to extend the future research to other fields, i.e. labor market and employment, nuptiality, and education.

As a concluding remark to the dissertation I would say that Kazakhstan is a relatively newly independent state with the demographic history rich with events and the future full of promises. The existing lack of understanding and application of population forecasts and projections by the current policy-makers will



**Contents**

## Introduction

The future is inherently unknown and in most regards – unknowable, however people are always fascinated about it. At all levels – local, national and global many professionals, politicians as well as ordinary people are concerned about political, socioeconomic, cultural and environmental consequences of demographic changes which might, perhaps, explain growing interest in population forecasts and projections.

Various factors influence demographic situation in the country often in unpredictable ways and the present population size and structure is fundamental in determining the prospects of the socioeconomic development, political stability and national security. Due to the current age and sex composition and because of the swiftly spreading attitude of "egoistical individualism" among young generations the age-structure of the population of Kazakhstan is most likely to change in the future. The rise of the birth rate which could be noticed nowadays is most probably of a temporary character and in all likelihood it is the result of population momentum of the second wave of so called "Baby Boom" of the mid 1980s combined with realization of the births postponed during the transition period. Certainly, the present boom of births will somehow put off for several decades and overlay the massive retirement of the first wave of baby-boomers in 10-15 years; however it does not mean that Kazakhstan has evaded ageing of its population in the later future.



It might be assumed that Kazakhstan with its regions is not an exception to this rule. Although, some regions of the country seem to be close to more or less advanced stage of the demographic transition, but there are other regions which are quite far from it, hence the mentioned homogeneity seems to be part of the far future, certainly not of the following two decades, therefore it might be supposed that the regional dissimilarities are expected to exist and be apparent, but most on a regional level.

Besides, the research concentrated on finding out *the most probable future population of Kazakhstan and its composition.* According to the forecast results the country's population will most certainly increase in the coming two decades and the increase might be expected to be quite impressive (for 25%) and that is mostly will be owed to the current fertility boom (see Figure 1). All three types of forecasts and all their scenarios seem to coincide on the point of population increase despite some dissimilarity in numbers. Thus, related to the increase of the population and following the fertility boom waves the age structure of the Kazakhstani population is assumed to fluctuate and through these fluctuations a gradual trend towards ageing could undoubtedly be noticed. Female population of the country is more likely to be the first to face the issues of ageing in contrast to male as well as urban compared to rural.

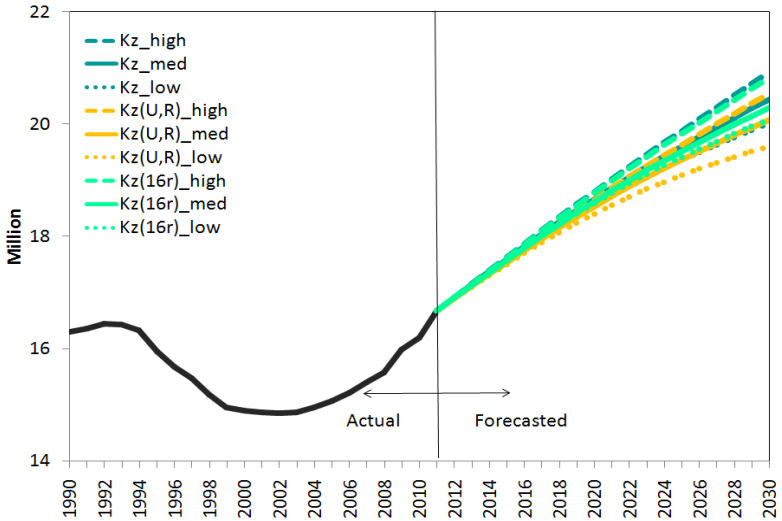
## Conclusion

The present research has shown that the variations in three demographic variables - fertility, mortality and migration—together

determining characteristic of the population. In case of urban/rural and regional specificities in population development process, generally they do play some role on a local level with much less impact on a state.

Also there was the question of *regional and residential differentials making difference in forecast outcomes and possible persistence of those differences in the future.* Indeed, the regional and residential specifics of the population do make difference in forecast outcomes, however not as great as it could be expected. Besides, it cannot be said with assurance that the differences between the forecast results were stemmed by their nature (one considering urban/rural demographic specifics and the other taking into account regional diversities). It is a known fact that when populations reach a certain stage of demographic transition they tend to strive to homogeneity.

***Figure 1 – Actual and forecasted population of Kazakhstan: High, medium and low variants of three types of forecasts***






In such circumstances, the development of socioeconomic policies and measures that will help to reduce the negative effects of coming changes of the size and age structure of Kazakhstani population requires deep and systematic study. And any amendments in policies and strategies related to production and consumption of goods and services, social infrastructure, housing, health care and pension systems, education etc. are impossible without knowledge of the future demographic situation in the country. Population forecasting is one of the constituent elements of planning and decision-making. It allows us to identify the possible shifts in socioeconomic development and plays an important role in the evaluation of long-term plans

Forecasting future population size and structure is one of the most important tasks of any national statistics but unfortunately not all of them are capable of producing official forecasts and/or projections yet, because of many different reasons. Population forecasts usually may differ in their time horizon, geographic coverage, methods applied and their use. Geographic coverage can range from local areas like counties or cities to the entire world. Local-area forecasts tend to use shorter time horizons, typically around 10-20 years, whereas national forecasting can extend decades into the future. Usually a small region forecasts include such characteristics as educational and labour force composition, urban/rural places of residence, ethnics or household type. In contrast, forecasts made for large areas and longer terms typically output

more limited number of variables, primarily population broken down by age and sex.

The diversity of types of forecasts is driven by the diversity of users' needs (Lutz et al 1996). Commercial organizations often use forecasts for marketing research and generally want population classified by socioeconomic categories such as income and consumption habits (in addition to age and sex) and by place of residence. Government planners may be concerned with population aging and its potential social and economic impact. They may, therefore, desire longer-term forecasts, and want to know more about the health status and living arrangements of the elderly (O'Neill et al 2001).

With regard to an application of population forecasts in planning and decision making activities by institutions related to social, economic and political fields is not yet wide-spread in Kazakhstan as it might be desired. This may be related to the fact that, although, the Agency on Statistics of Kazakhstan is decennially conducts nationwide Census of Population, however it does not carry out any official forecasts. Apart from the international institutions, there are only several private vendors making forecasts or more precisely, projections, but they are not sufficient enough to meet the current and future needs in qualitative and accurate population forecasts in Kazakhstan.

The four major institutions producing population projections for nearly all of the world’s main countries and regions, including Kazakhstan, and disseminating their results are the United Nations



perspectives. The data had their limitations, however. They contain hardly any information on age-specific internal migration, on ethnicity as well as more detailed mortality and fertility data. Also, there is an issue of reliability. There were found several inconsistencies in population numbers and in mortality accounts.

As a theoretical background of the research four major theories (demographic transition theory and second demographic transition, the theory of epidemiologic transition and the mobility transition theory) related to population development are selected. They describe and justify general developmental changes of fertility, mortality and migration components relevant to current and future character of population reproduction in Kazakhstan.

**Results and discussion**

The major contributions of this research were to study the *major characteristics determining population development and change in Kazakhstan.* It seems that the main determining characteristic of the population is age or rather generations. Currently there are coexisting two types of demographic behaviour in the country depending on the generation: the Soviet generation i.e. people born before independence and the generation of independence time, born respectively after gaining independence. These two large generations had different types of upbringing and different values and attitudes, which are even further altering for the younger generation. Since matrimonial and reproductive behaviour of people is closely connected to values and attitudes then it comes out to be a

The following steps relate to the calculations of migration rates based either on migration data, trend extrapolation, structural models or model schedules, and then $B^{k+1}$ - the number of births is forecasted applying to $P_x^{k,f}$ - the female population in each age cohort $f_x$ - the age-specific births rates as described by formula (3) and applying ϕ - the index of femininity numbers of girls and boys are then separately calculated.

$$B^{k+1} = \frac{1}{2} \sum_{x=14}^{49} P_x^{k,f} * (f_x + S_x^{f} * f_{x+1}) \quad (3)$$

Obtained births are added to the rest of the population, as a result one gets a forecasted total population by age and sex. Resulting population serves as the base for forecasts of the next interval. The process is repeated until the final target year in the forecast horizon has been reached.

The cohort-component method is now the most widely used of the analytical methods for preparing national and sub-national population forecasts. Development of this method was the major innovation in the evolution of forecasting methodology (O'Neill, 2001).

In case of Kz(U,R) and Kz(16r) types of forecasts urban/rural and interregional migration was treated separately and was added in the end to already forecasted population as net numbers of migrants according to sex and age.

Data from the Kazakhstan's Agency on Statistics was extensively utilized in this research. Using this data source, we could explore demographic scenarios in Kazakhstan from urban/rural and regional



(UN), United States Census Bureau (USCB), the World Bank (WB), and the International Institute for Applied Systems Analysis (IIASA). For some reasons the Institutions offer markedly different results. For example, according to the UN's projection population of Kazakhstan will reach approximately 18,5 million in 2030 whereas the U.S. Census Bureau's International Data Base suggests slightly more than 20 million people for the same year.

The explanation for such significant difference in the results could be found in methods applied by the institutions or in the accuracy of data used, in any case, the main point is that except giving general descriptions of their methodology, neither UN nor the USCB provide a detailed accounting of the reasoning underlying the specific assumptions made for different countries and regions of the world (O'Neill et al. 2001) and also they do not take into account peculiarities of demographic situation of a country under study in terms of historical trends and regional diversifications.

Therefore, it is absolutely necessary for any country to develop its own sphere of population forecasting, to prepare professional demographers and acquire experience by continually producing forecasts and that may, in time, permit to meet the requirements in relevant and appropriately done forecasts, which will certainly, extend their use by policymakers and other users, and also, lead to improvements in decision making process.

## Aim of the study

The primary aim of the study was to produce three types of deterministic population forecasts for Kazakhstan up to the year 2030, and compare and analyse their differences and try to find out the main factors determining population development in the country.

## Research questions

Using available data we attempt to study the following questions:

- What are the major characteristics determining population development and change?
- Do regional and residential differentials make difference in forecast outcomes?
- And if yes, will these differences persist in the future?
- What is the most probable future population of Kazakhstan and its sex and age composition?

## Material and methods

Before producing the forecasts, this research examined the past and recent demographic developments in Kazakhstan and addressed methodological issues related to population forecasting techniques. A widely used cohort-component method with its ability to preserve age and sex composition of the population was considered (1).



$$P_{(t+n)} = P_{(t)} + B_t^{t+n} - D_t^{t+n} + IM_t^{t+n} - OM_t^{t+n} \quad (1)$$

where:

$P_{(t+n)}$ = Population at the end of the period (at time t+n)

$P_{(t)}$ = population at the beginning of the period (at time t)

$B_t^{t+n}$ = births during the period (time t to t+n)

$D_t^{t+n}$ = deaths during the period (time t to t+n)

$IM_t^{t+n}$ = in-migration during the period (time t to t+n)

$OM_t^{t+n}$ = out-migration during the period (time t to t+n)

To generate population forecast with this model, the separate data sets for each of these components should have to be created. The base population is being divided into cohorts, as regard to age cohorts, they are usually defined as one or five-year age groups with 85+ or 100+ as the eldest cohorts and then the population can be subdivided by regions, ethnicity and urban/rural places of residence, which typically leads to more data requirements and calculations, but the procedure remains the same.

The forecasting begins with calculation of the age and sex-specific rate of transformation for the initial population, which is done in order to obtain the number of persons who survive to the end of the forecast interval. The transformation rates defined as $S_x$ are usually derived from life tables using $L_x$ - numbers of person-years lived between exact age x and x+n.

$$S_x = L_{x+1}/L_x \quad (2)$$